

Amendments to the Claims

Please amend Claims 1-3, 7-10, 13-18 and 20-21. Please also amend withdrawn Claims 22, 23 and 25. Please cancel Claim 19. Please add Claims 28-52. The Claim Listing below will replace all prior versions of the claims in the application.

Claim Listing

1. (Currently Amended) A proton-conducting polymer membrane based on polyazoles, ~~obtainable~~ obtained by a process comprising the steps of:
 - A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity,
or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion;
 - B) heating the mixture from step A), ~~preferably under inert gas,~~ and polymerizing until an intrinsic viscosity of up to 1.5 dl/g, ~~preferably from 0.3 to 1.0 dl/g, in particular from 0.5 to 0.8 dl/g,~~ is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D)[[.,.]];
 - C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
 - D) heating the mixture from step C), ~~preferably under inert gas,~~ and polymerizing until an intrinsic viscosity of up to 1.5 dl/g, ~~preferably from 0.3 to 1.0 dl/g, in particular from 0.5 to 0.8 dl/g,~~ is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B)[[.,.]];

- E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D) [.,.];
 - F) applying forming a layer by using applying the mixture according to obtained in step E) on a carrier or on an electrode,
 - G) heating the sheetlike structure/layer obtainable obtained according to step F), preferably under inert gas, until an intrinsic viscosity of more than 1.5 dl/g, preferably of more than 1.8 dl/g, in particular of more than 1.9 dl/g, is attained to form a polyazole block copolymer[.,.]membrane; and
 - H) treating partially hydrolyzing the polyphosphoric acid in the membrane formed in step G) [(.)]until it is self-supporting[D]), thereby forming the proton-conducting polymer membrane.
2. (Currently Amended) The membrane as claimed in claim 1, characterized in that the aromatic tetraamino compounds having a high phosphoric acid affinity used are 2,3,5,6-tetraaminopyridine, 3,3',4,4' tetraaminodiphenylsulfone, 3,3',4,4' -tetraaminodiphenyl ether and salts thereof, especially the mono-, di-, tri- and tetrahydrochloride derivatives thereof.
3. (Currently Amended) The membrane as claimed in claim 1, characterized in that the aromatic tetraamino compounds having a low phosphoric acid affinity used are 3,3',4,4' -tetraaminobiphenyl, 1,2,4,5-tetraaminobenzene, 3,3',4,4'-tetraaminobenzophenone, 3,3',4,4' -tetraaminodiphenylmethane and 3,3',4,4' -tetraaminodiphenyldimethylmethane and salts thereof, especially the mono-, di-, tri- and tetrahydrochloride derivatives thereof.
4. (Original) The membrane as claimed in claim 1, characterized in that the aromatic carboxylic acids having a high phosphoric acid affinity used are pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazinedicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-dicarboxylic acid, 5-hydroxyisophthalic acid, 4-hydroxyisophthalic acid, 2-hydroxyterephthalic acid, 5-aminoisophthalic acid, 5-N,N-

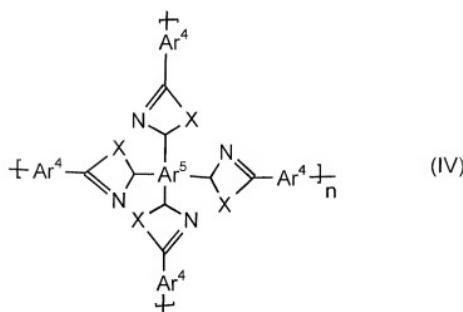
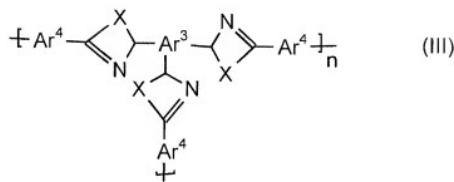
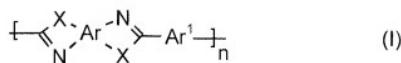
dimethylaminoisophthalic acid, 5-N,N-diethylaminoisophthalic acid, 2,5-dihydroxyterephthalic acid, 2,6-dihydroxyisophthalic acid, 4,6-dihydroxyisophthalic acid, 2,3-dihydroxyphthalic acid, 2,4-dihydroxyphthalic acid, 3,4-dihydroxyphthalic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid and diphenylsulfone-4,4'-dicarboxylic acid.

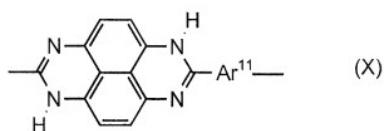
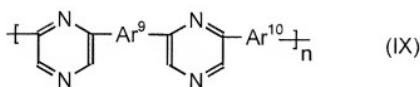
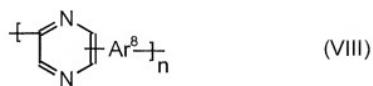
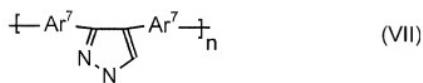
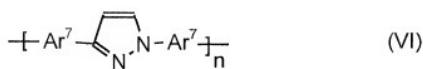
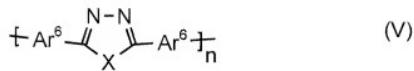
5. (Original) The membrane as claimed in claim 1, characterized in that the aromatic carboxylic acids having a low phosphoric acid affinity used are isophthalic acid, terephthalic acid, phthalic acid, 3-fluorophthalic acid, 5-fluoroisophthalic acid, 2-fluoroterephthalic acid, tetrafluorophthalic acid, tetrafluoroisophthalic acid, tetrafluoroterephthalic acid, 1,4-naphthalenedicarboxylic acid, 1,5-naphthalenedicarboxylic acid, 2,6-naphthalenedicarboxylic acid, 2,7-naphthalenedicarboxylic acid, diphenic acid, diphenyl ether 4,4' -dicarboxylic acid, benzophenone-4,4' -dicarboxylic acid, biphenyl-4,4'-dicarboxylic acid, 4-trifluoromethylphthalic acid, 2,2-bis(4-carboxyphenyl)hexafluoropropane, 4,4'-stilbenedicarboxylic acid and 4-carboxycinnamic acid.
6. (Original) The membrane as claimed in claim 1, characterized in that the diaminocarboxylic acids having a high phosphoric acid affinity used are diaminobenzoic acid and the mono and dihydrochloride derivatives thereof, and also 1,2-diamino-3'-carboxy acid 4,4'-diphenyl ether.
7. (Currently Amended) The membrane as claimed in claim 1, characterized in that the aromatic carboxylic acids used are tricarboxylic acids, tetracarboxylic acids or the C1-C20-alkyl esters or C5-C12-aryl esters thereof or the acid anhydrides thereof or the acid chlorides thereof, preferably ~~1,3,5-benzenetricarboxylic acid (trimesic acid); 1,2,4-benzenetricarboxylic acid (trimellitic acid); (2-carboxyphenyl)iminodiacetic acid, 3,5,3'-biphenyltricarboxylic acid; 3,5,4' biphenyltricarboxylic acid and/or 2,4,6-pyridinetricarboxylic acid.~~
8. (Currently Amended) The membrane as claimed in claim 1, characterized in that the aromatic carboxylic acids used are tetracarboxylic acids, the C1-C20-alkyl esters or C5-

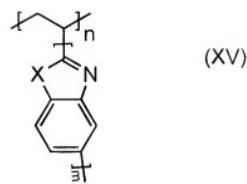
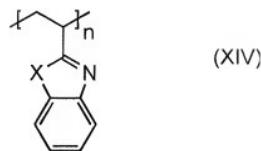
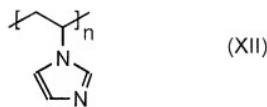
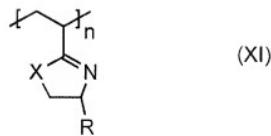
C12-aryl esters thereof or the acid anhydrides thereof or the acid chlorides thereof, preferably benzene 1,2,4,5-tetraearboxylic acids; naphthalene 1,4,5,8-tetraearboxylic acids, 3,5,3',5'-biphenyltetraearboxylic acid; benzophenonetetraearboxylic acid, 3,3',4,4'-biphenyltetraearboxylic acid, 2,2',3,3'-biphenyltetraearboxylic acid, 1,2,5,6-naphthalenetetraearboxylic acid, 1,4,5,8-naphthalenetetraearboxylic acid.

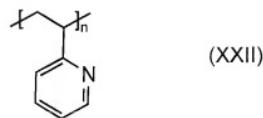
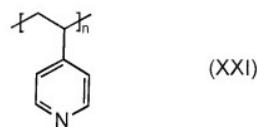
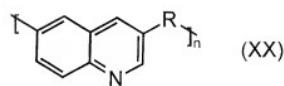
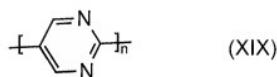
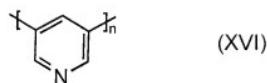
9. (Currently Amended) The membrane as claimed in claim 4, characterized in that the content of tricarboxylic acid or tetracarboxylic acids (based on dicarboxylic acid used) is between 0 and 30 mol%, preferably 0.1 and 20 mol%, in particular 0.5 and 10 mol%.
10. (Currently Amended) The membrane as claimed in claim 1, characterized in that the heteroaromatic carboxylic acids used are heteroaromatic dicarboxylic acids and tricarboxylic acids and tetracarboxylic acids which contain at least one nitrogen, oxygen, sulfur or phosphorus atom in the aromatic, preferably pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazinedicarboxylic acid, 2,4,6-pyridinetetricarboxylic acid, benzimidazole-5,6-dicarboxylic acid, and also the C1-C20-alkyl esters or C5-C12-aryl esters thereof, or the acid anhydrides thereof or the acid chlorides thereof.
11. (Original) The membrane as claimed in claim 1, characterized in that a polyphosphoric acid having a content, calculated as P₂O₅ (by acidimetry), of at least 83% is obtained in step A) and C).
12. (Original) The membrane as claimed in claim 1, characterized in that a solution or a dispersion/suspension is obtained in step A) and C).
13. (Currently Amended) The membrane as claimed in claim 1, characterized in that wherein the block copolymers based on polyazole obtained in step G) and comprising comprises repeat azole units of the general formula (I) and/or (II) and/or (III) and/or (IV) and/or (V) and/or (VI) and/or (VII) and/or (VIII) and/or (IX) and/or (X) and/or (XI) and/or (XII)

and/or (XIII) and/or (XIV) and/or (XV) and/or (XVI) and/or (XVII) and/or (XVIII) and/or (XIX) and/or (XX) and/or (XXI) and/or (XXII)







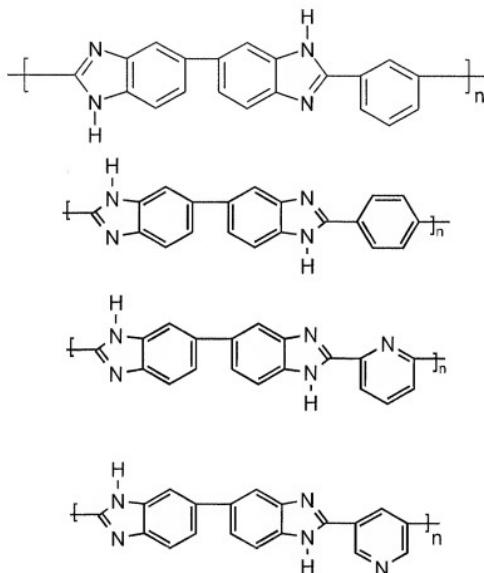


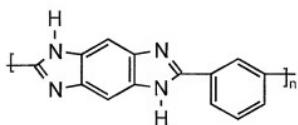
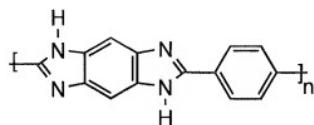
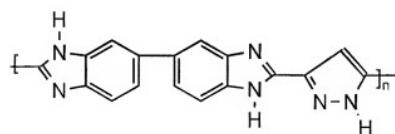
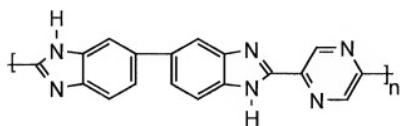
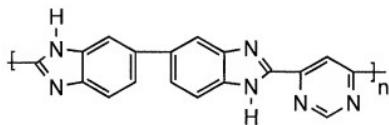
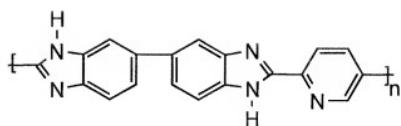
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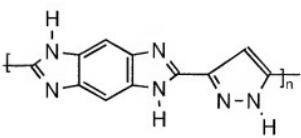
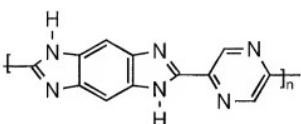
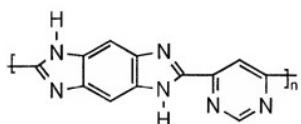
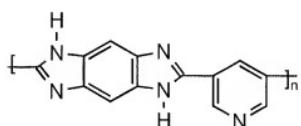
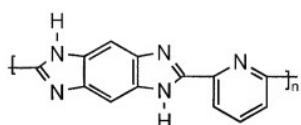
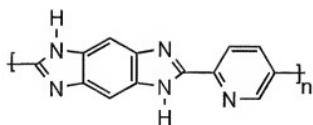
- Ar are the same or different and are each a tetravalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar¹ are the same or different and are each a divalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar² are the same or different and are each a di- or trivalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar³ are the same or different and are each a trivalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar⁴ are the same or different and are each a trivalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar⁵ are the same or different and are each a tetravalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar⁶ are the same or different and are each a divalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar⁷ are the same or different and are each a divalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar⁸ are the same or different and are each a trivalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar⁹ are the same or different and are each a di- or tri- or tetravalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar¹⁰ are the same or different and are each a di- or trivalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- Ar¹¹ are the same or different and are each a divalent aromatic or heteroaromatic group which may be mono- or polycyclic,
- X are the same or different and are each oxygen, sulfur or an amino group which bears a hydrogen atom, a group having 1-20 carbon atoms, ~~preferably a branched or unbranched alkyl or alkoxy group, or an aryl group as further radical,~~
- R is the same or different and is hydrogen, an alkyl group or an aromatic group, with the proviso that R in formula (XX) is not hydrogen, and

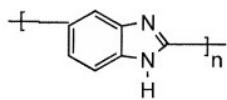
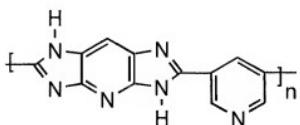
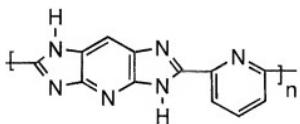
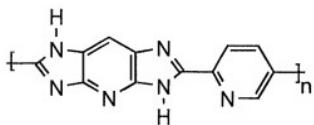
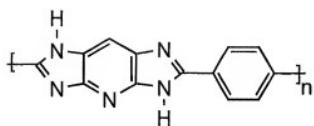
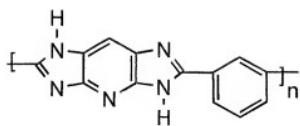
n, m are each an integer greater than or equal to 10, preferably greater than or equal to 100, are formed in step G).

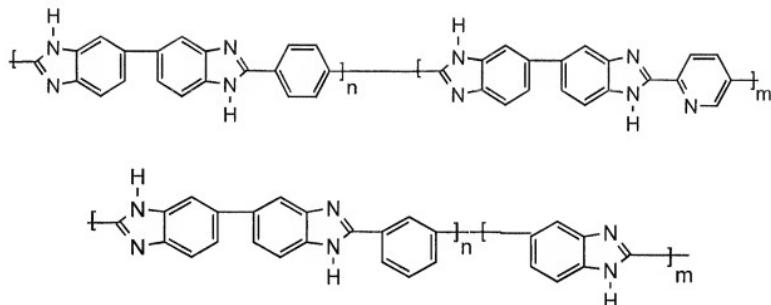
14. (Currently Amended) The membrane as claimed in claim 1, characterized in that a block copolymer containing repeat segments selected from the group of polybenzimidazole, poly(pyridines), poly(pyrimidines), polyimidazoles, polybenzothiazoles, polybenzoxazoles, polyoxadiazoles, polyquinoxalines, polythiadiazoles and poly(tetraazapyrroles) is formed in step G).
15. (Currently Amended) The membrane as claimed in claim 1, characterized in that a block copolymer obtained in step G containing comprises repeat benzimidazole units of the formula











where n and m are each an integer greater than or equal to 10, preferably greater than or equal to 100, is formed in step G).

16. (Currently Amended) The membrane as claimed in claim 1, characterized in that the membrane obtained in step H) is treated in the presence of moisture at temperature[[s]] and for a period until the membrane is self-supporting and can be removed from the carrier without damage.
17. (Currently Amended) The membrane as claimed in claim 1, characterized in that the membrane is treated in step H) at temperature[[s]] above 0°C and 150°C, preferably at temperatures between 10°C and 120°C, in particular between room temperature (20°C) and 90°C, in the presence of moisture or water and/or steam.
18. (Currently Amended) The membrane as claimed in claim 1, characterized in that the treatment of the membrane in step H) is between 10 seconds and 300 hours, preferably from 1 minute to 200 hours.
19. (Cancelled)

20. (Currently Amended) The membrane as claimed in claim 1, characterized in that a layer having a thickness of $20 \mu\text{m}$ and $4000 \mu\text{m}$, ~~preferably between 30 and 3500 μm , in particular between 50 and 3000 μm~~ is obtained in step F).
21. (Currently Amended) The membrane as claimed in claim 1, characterized in that the membrane formed by step H) has a thickness between $15 \mu\text{m}$ and $3000 \mu\text{m}$, ~~preferably between 20 and 2000 μm , in particular between 20 and 1500 μm~~ .
22. (Withdrawn-Currently Amended) An electrode which having a proton-conducting polymer coating based on polyazoles, obtainable obtained by a process comprising the steps of:
A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity,
or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion;
B) heating the mixture from step A), ~~preferably under inert gas~~, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g , ~~preferably from 0.3 to 1.0 dl/g , in particular from 0.5 to 0.8 dl/g~~ , is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D)[[.]];
C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
D) heating the mixture from step C), ~~preferably under inert gas~~, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g , ~~preferably from 0.3 to 1.0 dl/g , in particular from 0.5 to 0.8 dl/g~~ , is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B)[[.]];

- E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D)[[.,.]];
 - F) applying forming a layer by using applying the mixture according to obtained in step E) on an electrode[[.,.]];
 - G) heating the sheetlike structure/layer obtainable obtained according to step F), preferably under inert gas, until an intrinsic viscosity of more than 1.5 dl/g, preferably of more than 1.8 dl/g, in particular of more than 2.0 dl/g, is attained to form a polyazole block copolymer[[.,.]] membrane; and
 - H) treating partially hydrolyzing the polyphosphoric acid in the membrane formed in step G), thereby forming the electrode.
- 23. (Withdrawn-Currently Amended) The electrode as claimed in claim 22, the coating having a thickness between 2 μm and 3000 μm , preferably between 3 and 2000 μm , in particular between 5 and 1500 μm .
- 24. (Withdrawn) A membrane-electrode unit comprising at least one electrode and at least one membrane as claimed in claim 1.
- 25. (Withdrawn-Currently Amended) A membrane-electrode unit comprising at least one electrode as claimed in claim 22 and at least one membrane based on polyazoles, obtainable obtained by a process comprising the steps of:
 - A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion;
 - B) heating the mixture from step A), preferably under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g, preferably from 0.3 to 1.0 dl/g, in particular from 0.5 to

- 0.8 dl/g, is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D)[[],];
- C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
- D) heating the mixture from step C), preferably under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g, preferably from 0.3 to 1.0 dl/g, in particular from 0.5 to 0.8 dl/g, is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B)[[],];
- E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D)[[],];
- F) applying forming a layer by using applying the mixture according to obtained in step E) on a carrier or on an electrode[[],];
- G) heating the sheetlike structure/layer obtainable obtained according to step F), preferably under inert gas, until an intrinsic viscosity of more than 1.5 dl/g, preferably of more than 1.8 dl/g, in particular of more than 1.9 dl/g, is attained to form a polyazole block copolymer membrane[[],]; and
- H) treating partially hydrolyzing the polyphosphoric acid in the membrane formed in step G) [[() until it is self-supporting[()]], forming thereby the membrane-electrode unit.
26. (Withdrawn) A fuel cell comprising one or more membrane-electrode units as claimed in claim 24.
27. (Withdrawn) A fuel cell comprising one or more membrane-electrode units as claimed in claim 25.

28. (New) The membrane as claimed in claim 1, characterized in that heating the mixture from steps A) and C) and heating the layer obtained according to step F) is performed under inert gas.
29. (New) The membrane as claimed in claim 9, characterized in that the content of tricarboxylic acid or tetracarboxylic acids (based on dicarboxylic acid used) is between 0.1 mol% and 20 mol%.
30. (New) The membrane as claimed in claim 29, characterized in that the content of tricarboxylic acid or tetracarboxylic acids (based on dicarboxylic acid used) is between 0.5 mol% and 10 mol%.
31. (New) The membrane as claimed in claim 10, characterized in that the heteroaromatic carboxylic acids used are heteroaromatic dicarboxylic acids and tricarboxylic acids and tetracarboxylic acids which contain at least one nitrogen, oxygen, sulfur or phosphorus atom in the aromatic selected from: pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazinedicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-dicarboxylic acid, and also the C1-C20-alkyl esters or C5-C12-aryl esters thereof, or the acid anhydrides thereof or the acid chlorides thereof.
32. (New) The membrane as claimed in claim 13, characterized in that X is a branched or unbranched alkyl or alkoxy group, or an aryl group; and n, m are each an integer greater than or equal to 100.
33. (New) The membrane as claimed in claim 15, characterized in that n and m are each an integer greater than or equal to 100.
34. (New) The membrane as claimed in claim 17, characterized in that the membrane is treated in step H) at temperature between 10°C and 120°C.

35. (New) The membrane as claimed in claim 34, characterized in that the membrane is treated in step H) at temperature between room temperature (20°C) and 90°C.
36. (New) The membrane as claimed in claim 18, characterized in that the treatment of the membrane in step H) is from 1 minute to 200 hours.
37. (New) The membrane as claimed in claim 20, characterized in that the layer having a thickness of 30 µm and 3500 µm is obtained in step F).
38. (New) The membrane as claimed in claim 37, characterized in that the layer having a thickness of 50 µm and 3000 µm is obtained in step F).
39. (New) The membrane as claimed in claim 21, characterized in that the membrane formed by step H) has a thickness between 20 µm and 2000 µm.
40. (New) The membrane as claimed in claim 39, characterized in that the membrane formed by step H) has a thickness between 20 µm and 1500 µm.
41. (New) The membrane as claimed in claim 7, characterized in that the aromatic carboxylic acids used are 1,3,5-benzenetricarboxylic acid (trimesic acid), 1,2,4-benzenetricarboxylic acid (trimellitic acid), (2-carboxyphenyl)iminodiacetic acid, 3,5,3'-biphenyltricarboxylic acid, 3,5,4'-biphenyltricarboxylic acid or 2,4,6-pyridinetricarboxylic acid.
42. (New) The membrane as claimed in claim 8, characterized in that the aromatic carboxylic acids used are benzene-1,2,4,5-tetracarboxylic acids, naphthalene-1,4,5,8-tetracarboxylic acids, 3,5,3',5'-biphenyltetracarboxylic acid, benzophenonetetracarboxylic acid, 3,3',4,4'-biphenyltetracarboxylic acid, 2,2',3,3'-biphenyltetracarboxylic acid, 1,2,5,6-naphthalenetetracarboxylic acid, or 1,4,5,8-naphthalenetetracarboxylic acid.

43. (New) A proton-conducting polymer membrane based on polyazoles, obtained by a process comprising the steps of:
- A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion;
 - B) heating the mixture from step A) and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D);
 - C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
 - D) heating the mixture from step C) and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B);
 - E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D);
 - F) heating the mixture obtained according to step E) to temperature of up to 350 °C, until an intrinsic viscosity of more than 1.5 dl/g is attained to form a polyazole block copolymer membrane;
 - G) forming a layer by applying the polazole block copolymer according to step F) on a carrier or on an electrode; and
 - H) partially hydrolyzing the polyphosphoric acid in the membrane formed in step F) until it is self-supporting, thereby forming the proton-conducting polymer membrane.

44. (New) A proton-conducting polymer membrane based on polyazoles, obtained by a process comprising the steps of:
- A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion, wherein a total content of monomers having the low phosphoric acid affinity based on all monomers used in step A) is up to 40% by weight;
 - B) heating the mixture from step A), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D);
 - C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
 - D) heating the mixture from step C), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B);
 - E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D);
 - F) forming a layer by applying the mixture obtained in step E) on a carrier or on an electrode;
 - G) heating the layer obtained according to step F), until an intrinsic viscosity of more than 1.5 dl/g is attained to form a polyazole block copolymer membrane; and
 - H) partially hydrolyzing the polyphosphoric acid in the membrane formed in step G) until it is self-supporting, thereby forming the proton-conducting polymer membrane.

45. (New) A proton-conducting polymer membrane based on polyazoles, obtained by a process comprising the steps of:

A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with

one or more aromatic carboxylic acids or esters thereof having a high phosphoric acid affinity and selected from pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazi nedicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-dicarboxylic acid, 5-hydroxyisophthalic acid, 4-hydroxyisophthalic acid, 2-hydroxyterephthalic acid, 5-aminoisophthalic acid, 5-N,N-dimethylaminoisophthalic acid, 5-N,N-diethylaminoisophthalic acid, 2,5-dihydroterephthalic acid, 2,6-dihydroxyisophthalic acid, 4,6-dihydroxyisophthalic acid, 2,3-dihydroxyphthalic acid, 2,4-dihydroxyphthalic acid, 3,4-dihydroxyphthalic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid and diphenylsulfone-4,4'-dicarboxylic acid, which contain at least two acid groups per carboxylic acid monomer,

or one or more aromatic carboxylic acids or esters thereof having a low phosphoric acid affinity and selected from isophthalic acid, terephthalic acid, phthalic acid, 3-fluorophthalic acid, 5-fluoroisophthalic acid, 2-fluoroterephthalic acid, tetrafluorophthalic acid, tetrafluoroisophthalic acid, tetrafluoroterephthalic acid, 1,4-naphthalenedicarboxylic acid, 1,5-naphthalenedicarboxylic acid, 2,6-naphthalenedicarboxylic acid, 2,7-naphthalenedicarboxylic acid, diphenic acid, diphenyl ether 4,4'-dicarboxylic acid, benzophenone-4,4'-dicarboxylic acid, biphenyl-4,4'-dicarboxylic acid, 4-trifluoromethylphthalic acid, 2,2-bis(4-carboxyphenyl)hexafluoropropane, 4,4'- stilbenedicarboxylic acid and 4-carboxycinnamic acid,

or one or more aromatic and/or heteroaromatic diaminocarboxylic acids selected from diaminobenzoic acid and the mono and dihydrochloride derivatives thereof, and also 1,2-diamino-3'-carboxy acid 4,4'-diphenyl ether, having a high phosphoric acid affinity in polyphosphoric acid,

thereby forming a solution and/or dispersion;

- B) heating the mixture from step A), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D);
- C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with

one or more aromatic carboxylic acids or esters thereof having a high phosphoric acid affinity and selected from pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazi nedicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-dicarboxylic acid, 5-hydroxyisophthalic acid, 4-hydroxyisophthalic acid, 2-hydroxyterephthalic acid, 5-aminoisophthalic acid, 5-N,N-dimethylaminoisophthalic acid, 5-N,N-diethylaminoisophthalic acid, 2,5-dihydroxyterephthalic acid, 2,6-dihydroxyisophthalic acid, 4,6-dihydroxyisophthalic acid, 2,3-dihydroxyphthalic acid, 2,4-dihydroxyphthalic acid, 3,4-dihydroxyphthalic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid and diphenylsulfone-4,4'-dicarboxylic acid, which contain at least two acid groups per carboxylic acid monomer,

or one or more aromatic carboxylic acids or esters thereof having a low phosphoric acid affinity and selected from isophthalic acid, terephthalic acid, phthalic acid, 3-fluorophthalic acid, 5-fluoroisophthalic acid, 2-fluoroterephthalic acid, tetrafluorophthalic acid, tetrafluoroisophthalic acid, tetrafluoroterephthalic acid, 1,4-naphthalenedicarboxylic acid, 1,5-naphthalenedicarboxylic acid, 2,6-naphthalenedicarboxylic acid, 2,7-naphthalenedicarboxylic acid, diphenic acid, diphenyl ether 4,4'-dicarboxylic acid, benzophenone-4,4'-dicarboxylic acid, biphenyl-4,4'-dicarboxylic acid, 4-trifluoromethylphthalic acid, 2,2-bis(4-carboxyphenyl)hexafluoropropane, 4,4'-stilbenedicarboxylic acid and 4-carboxycinnamic acid,

or one or more aromatic and/or heteroaromatic diaminocarboxylic acids selected from diaminobenzoic acid and the mono and dihydrochloride derivatives thereof, and also 1,2-diamino-3'-carboxy acid 4,4'-diphenyl ether, having a high phosphoric acid affinity in polyphosphoric acid,

thereby forming a solution and/or dispersion;

- D) heating the mixture from step C), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B);
 - E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D);
 - F) forming a layer by applying the mixture obtained in step E) on a carrier or on an electrode,
 - G) heating the layer obtained according to step F); until an intrinsic viscosity of more than 1.5 dl/g is attained to form a polyazole block copolymer membrane,
 - H) partially hydrolyzing the polyphosphoric acid in the membrane formed in step G) until it is self-supporting, thereby forming the proton-conducting polymer membrane.
46. (New) The membrane as claimed in claim 1, characterized in that the intrinsic viscosity of the mixture from steps A) and C) and the layer obtained according to step F) is from 0.3 dl/g to 1.0 dl/g.
47. (New) The membrane as claimed in claim 46, characterized in that the intrinsic viscosity of the mixture from steps A) and C) and the layer obtained according to step F) is from 0.5 dl/g to 0.8 dl/g.
48. (New) A proton-conducting polymer membrane based on polyazoles, obtained by a process comprising the steps of:
- A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity,
or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion, wherin a total content of monomers having the low phosphoric acid affinity based on all monomers used in step A) is up to 40% by weight;

- B) heating the mixture from step A), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D);
- C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
- D) heating the mixture from step C), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B);
- E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D);
- F) heating the mixture obtained according to step E) to temperature of up to 350 °C, until an intrinsic viscosity of more than 1.5 dl/g is attained to form a polyazole block copolymer membrane;
- G) forming a layer by applying the polazole block copolymer according to step F) on a carrier or on an electrode; and
- H) partially hydrolyzing the polyphosphoric acid in the membrane formed in step F) until it is self-supporting, thereby forming the proton-conducting polymer membrane.
49. (New) A proton-conducting polymer membrane based on polyazoles, obtained by a process comprising the steps of:
- A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof having a high phosphoric acid affinity and selected from pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazi nedicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-

dicarboxylic acid, 5-hydroxyisophthalic acid, 4-hydroxyisophthalic acid, 2-hydroxyterephthalic acid, 5-aminoisophthalic acid, 5-N,N-dimethylaminoisophthalic acid, 5-N,N-diethylaminoisophthalic acid, 2,5-dihydroxterephthalic acid, 2,6-dihydroxyisophthalic acid, 4,6-dihydroxyisophthalic acid, 2,3-dihydroxyphthalic acid, 2,4-dihydroxyphthalic acid, 3,4-dihydroxyphthalic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid and diphenylsulfone-4,4'-dicarboxylic acid, which contain at least two acid groups per carboxylic acid monomer,

or one or more aromatic carboxylic acids or esters thereof having a low phosphoric acid affinity and selected from isophthalic acid, terephthalic acid, phthalic acid, 3-fluorophthalic acid, 5-fluoroisophthalic acid, 2-fluoroterephthalic acid, tetrafluorophthalic acid, tetrafluoroisophthalic acid, tetrafluoroterephthalic acid, 1,4-naphthalenedicarboxylic acid, 1,5-naphthalenedicarboxylic acid, 2,6-naphthalenedicarboxylic acid, 2,7-naphthalenedicarboxylic acid, diphenic acid, diphenyl ether 4,4'-dicarboxylic acid, benzophenone-4,4'-dicarboxylic acid, biphenyl-4,4'-dicarboxylic acid, 4-trifluoromethylphthalic acid, 2,2-bis(4-carboxyphenyl)hexafluoropropane, 4,4'-stilbenedicarboxylic acid and 4-carboxycinnamic acid,

or one or more aromatic and/or heteroaromatic diaminocarboxylic acids selected from diaminobenzoic acid and the mono and dihydrochloride derivatives thereof, and also 1,2-diamino-3'-carboxy acid 4,4'-diphenyl ether, having a high phosphoric acid affinity in polyphosphoric acid,

thereby forming a solution and/or dispersion;

- B) heating the mixture from step A), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D);
- C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with

one or more aromatic carboxylic acids or esters thereof having a high phosphoric acid affinity and selected from pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6-pyrimidinedicarboxylic acid, 2,5-pyrazinedicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-

dicarboxylic acid, 5-hydroxyisophthalic acid, 4-hydroxyisophthalic acid, 2-hydroxyterephthalic acid, 5-aminoisophthalic acid, 5-N,N-dimethylaminoisophthalic acid, 5-N,N-diethylaminoisophthalic acid, 2,5-dihydroxyterephthalic acid, 2,6-dihydroxyisophthalic acid, 4,6-dihydroxyisophthalic acid, 2,3-dihydroxyphthalic acid, 2,4-dihydroxyphthalic acid, 3,4-dihydroxyphthalic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid and diphenylsulfone-4,4'-dicarboxylic acid, which contain at least two acid groups per carboxylic acid monomer,

or one or more aromatic carboxylic acids or esters thereof having a low phosphoric acid affinity and selected from isophthalic acid, terephthalic acid, phthalic acid, 3-fluorophthalic acid, 5-fluoroisophthalic acid, 2-fluoroterephthalic acid, tetrafluorophthalic acid, tetrafluoroisophthalic acid, tetrafluoroterephthalic acid, 1,4-naphthalenedicarboxylic acid, 1,5-naphthalenedicarboxylic acid, 2,6-naphthalenedicarboxylic acid, 2,7-naphthalenedicarboxylic acid, diphenic acid, diphenyl ether 4,4'-dicarboxylic acid, benzophenone-4,4'-dicarboxylic acid, biphenyl-4,4'-dicarboxylic acid, 4-trifluoromethylphthalic acid, 2,2-bis(4-carboxyphenyl)hexafluoropropane, 4,4'-stilbenedicarboxylic acid and 4-carboxycinnamic acid,

or one or more aromatic and/or heteroaromatic diaminocarboxylic acids selected from diaminobenzoic acid and the mono and dihydrochloride derivatives thereof, and also 1,2-diamino-3'-carboxy acid 4,4'-diphenyl ether, having a high phosphoric acid affinity in polyphosphoric acid,

thereby forming a solution and/or dispersion;

- D) heating the mixture from step C), under inert gas, and polymerizing until an intrinsic viscosity of up to 1.5 dL/g is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B);
- E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D);
- F) heating the mixture obtained according to step E) to temperature of up to 350 °C, until an intrinsic viscosity of more than 1.5 dL/g is attained to form a polyazole block copolymer membrane;

- G) forming a layer by applying the polyazole block copolymer according to step F) on a carrier or on an electrode on a carrier or on an electrode; and
 - H) partially hydrolyzing the polyphosphoric acid in the membrane formed in step g) until it is self-supporting, thereby forming the proton-conducting polymer membrane.
50. (New) The membrane as claimed in claim 2, wherein the aromatic tetraamino compounds having a high phosphoric acid affinity are the mono-, di-, tri- and tetrahydrochloride derivatives of 2,3,5,6-tetraaminopyridine, 3,3',4,4'-tetraaminodiphenylsulfone, 3,3',4,4'-tetraaminodiphenyl ether.
51. (New) The membrane as claimed in claim 3, wherin the aromatic tetraamino compounds having a low phosphoric acid affinity are the mono-, di-, tri- and tetrahydrochloride derivatives of 3,3',4,4'-tetraaminobiphenyl, 1,2,4,5-tetraaminobenzene, 3,3',4,4'-tetraaminobenzophenone, 3,3',4,4'-tetraaminodiphenylmethane and 3,3',4,4'-tetraaminodiphenylmethane.
52. (New) A proton-conducting polymer membrane based on polyazoles, obtained by a process comprising the steps of:
- A) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids having a high phosphoric acid affinity in polyphosphoric acid to form a solution and/or dispersion;
 - B) heating the mixture from step A), and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step D);
 - C) mixing one or more aromatic tetraamino compounds having a high phosphoric acid affinity or low phosphoric acid affinity with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer which have a high

- phosphoric acid affinity or low phosphoric acid affinity, in polyphosphoric acid to form a solution and/or dispersion;
- D) heating the mixture from step C), and polymerizing until an intrinsic viscosity of up to 1.5 dl/g is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step B);
 - E) combining the polymer from step B) and the polymer from step D), the phosphoric acid affinity of the polymer from step B) being greater than the phosphoric acid affinity of the polymer from step D);
 - F) forming a layer by applying the mixture according to step E) on an electrode,
 - G) heating the layer obtained according to step F), until an intrinsic viscosity of more than 1.5 dl/g is attained to form a polyazole block copolymer membrane; and
 - H) partially hydrolyzing the polyphosphoric acid in the membrane formed in step G), thereby forming the proton-conducting polymer membrane.